CONCRETE CONSTRUCTION P O BOX 444 ELMHURST ILLINOIS TERRACE 4 5110

OCTOBER 1960

COMING NEXT MONTH

Residential Concrete. Residential concrete not only accounts for a very large share of the total concrete placed, but its quality and performance directly affect and influence more people than all the other uses of concrete put together. For this reason we consider the series of articles starting next month on concrete in residential construction to be must reading.

60-Second Photos in Construction. How on-the-spot Polaroid Land camera pictures serve a number of record keeping requirements on modern concrete construction jobs.

A 28-Foot Concrete Yawl. Whether this project pans out economically or not, it should provide a shot-in-the-arm for the basic notion that there simply are not many things that can't somehow be made of concrete.

Over 35,000 copies mailed. Edited for all who are concerned with quality, job placed concrete (including prestress, tilt-up, lift slab, and thin-shell)—its specification, production, handling, forming, reinforcing, placing, finishing, and curing: *Concrete Contractors, General Contractors, Engineers, Architects, Industrial Construction and Maintenance Men, Highway Engineers, Ready-Mixed and Prestressed Concrete Producers.*

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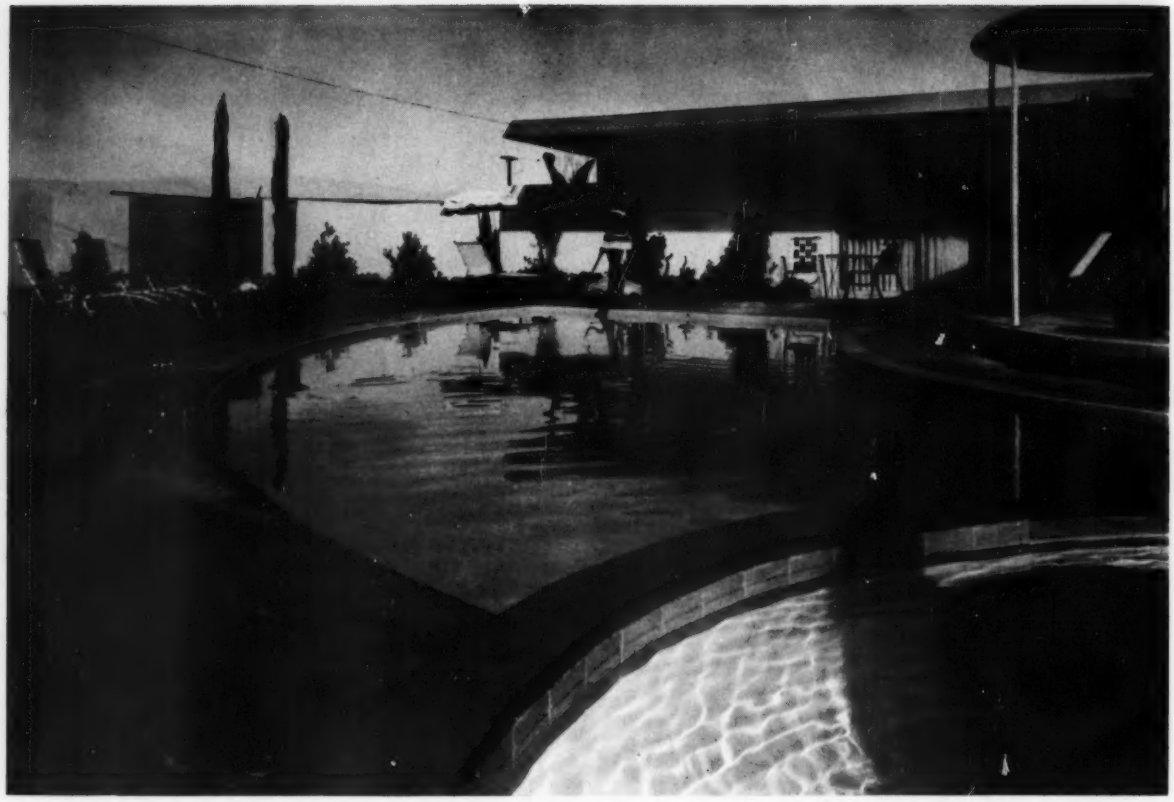


SWIMMING POOLS . . .

Another rapidly expanding construction market in which concrete has no serious competition

THE SWIMMING POOL BUSINESS makes a greater splash in the national economy each year. Right now, more than 170,000 American families enjoy recreation in their own pools. Before the end of 1960, according to estimates, around 50,000 more families will have joined the throng. In addition, thousands of municipal and club pools, and pools for motels, apartment buildings, schools, hotels, and neighborhood groups have been or are being built. It is small wonder that constructing swimming pools and supplying accessories for them has become a better than $700 million business since 1948. And this seems to be only the beginning.

During the past twelve years, ready mixed concrete has proved the most popular material for pool construction. Cast-in-place and pneumatically applied concrete has accounted for about 85 per cent of all pools built. The durability and beauty of concrete are two reasons for this. Another is the infinite variety of shapes into which concrete can be molded.

Rectangular pools are by no means outmoded. But many buyers want oval, circular or free form shapes such as the kidney. Some pools require unusual combinations of curves and straight lines to fit specific sites.

It is, of course, both possible and quite economical to produce concrete in a wide variety of pleasing colors. Not only can pool walls and slabs be cast with integral color right in the concrete, but sur-

POOL MATERIALS. In 1957 pneumatically applied concrete accounted for 72 percent of all the pools built; in 1959 this method of application accounted for only 54 percent. Cast-in-place concrete accounted for 23 percent of all the pools built in 1959 (up from 11 percent in 1957); in the same year vinyl or nylon liner accounted for 15 percent, and fiber glass, steel, aluminum and other materials for 8 percent.

rounding decks may also be colored to harmonize with settings and help eliminate glare. Abrasive grains of various types may also be worked into pool decks during finishing to produce safe, non-slip concrete surfaces. These plus values should, of course, always be provided by the contractor at the time a pool is installed, for experience indicates that later surface treatments may be both costly and unsatisfactory.

There are three ways to use ready mixed concrete to construct a swimming pool. The builder or contractor may cast the concrete into rigid forms. He may use any one of a number of machines to spray a relatively dry concrete on the sides and bottom of an excavation. Or he may use a similarly dry mix and pack the concrete against the excavation. The dry pack method, which demands that the installer have a great deal of experience and know-how, as well as a crew of genuine craftsmen, probably accounts for a very small percentage of all the concrete pools installed. Each of these methods has its own problems and techniques and each will be discussed generally here.

A few concrete pools are built above the ground, but the majority consist of a shell placed in an excavation. Consequently, pools must be designed to withstand water pressure from within. When pools are empty they must also resist earth pressures from without. Soil type, climate, and other local conditions will influence pool designs, the need for anchorage, and the thickness of walls and floor.

Many soils will require a subsurface drainage system. A line of tile under the deepest portion of the pool and around the outside of the wall footings affords good protection. For large pools, additional tile should be placed under the floor. Where subsoil drainage is slow, a bed of sand or cinders can be laid as the floor base. The bed should be thoroughly wetted, tamped and rolled.

Pool builders should be aware of such problems as expansive soils and frost upheaval. Expansive soil, particularly clay which is normally dry, can produce lifting forces as high as 400 pounds per square inch—more than enough to crack even reinforced concrete. Where either soil expansion or severe frost upheaval are likely to occur, consideration should be given to the possibility of over-excavating the pool area to provide for about 12 inches of gravel or permeable sand between the soil and the structure at all points. An asphalt liner may also be used between the concrete and the gravel.

The durability and watertightness of concrete depend on the water/cement ratio. For swimming pools, concrete containing not more than 6 gallons of water to each sack of cement is recommended. In regions where freezing winter weather is the rule, the amount of water should be reduced to 5½ gallons per sack. The sand, cement and aggregate ratios should be such that they provide a workable texture, neither too harsh nor over-sanded. The consistency of the concrete mix, as measured by the slump test, will depend primarily on the amount of water it contains. A common mix design for swimming pools is 1:2½:3½. However, soil conditions, climate, and temperature will influence the exact proportion.

There appears to be considerable agreement that all swimming pool concrete should be air entrained for winter freeze-thaw resistance and because air entrainment actually reduces permeability. Air entrained concrete is also somewhat more workable, exhibits less segregation and bleeding, permits a reduction in water content, and has better finishing characteristics.

Some authorities also believe that a water reducing agent should be used in conjunction with the air entraining agent in pool work to provide further reduction in the amount of water needed for placement and resultant higher strengths in the finished job. Permeability can also be further reduced by the proper use of a water reducing agent.

Large pools for communities, clubs or schools are almost always built with cast-in-place concrete. Generally they are rectangular in shape and must be carefully designed and engineered to fit local conditions.

A common type of large pool design consists of cantilever walls and a separate floor. Walls for this type of pool are usually 10 inches thick; the floor should be 6 to 8 inches thick. The amount of steel used to reinforce a concrete pool will depend on factors such as temperature range, distance between joints, and the quality of the concrete. As a rule horizontal steel should be .0025 times the cross-sectional area of the walls. If the subsoil and drainage is good, about one-half this amount will be sufficient for the floor.

Expansion joints are used in large pools to allow

for expansion and contraction of the concrete due to temperature and moisture changes. The most common types of joints consist of polyvinyl acetate or rubber waterstop or mastic fill, or combinations of waterstop and mastic fill. Some builders prefer to use waterstop with a piece of non-extruding-type premolded expansion joint filler placed in both the top and bottom of the waterstop. An advantage of the mastic fill type of joint is that defects can be easily located and repairs quickly made without the removal of a large volume of concrete.

Local conditions to a large extent dictate the location and spacing of expansion joints. However, 60 feet should be the maximum distance between the joints. They should be placed where the tendency to crack will be greatest. These places are at the junctures of walls and floor and where there is a sharp change in the floor grade.

It is possible to schedule concrete placing operations to avoid the need for construction joints within the walls and the floors. Horizontal joints between the floor and the walls can be made by bonding the new to the hardened concrete. For a lasting bond, the hardened surface should be roughened, thoroughly cleaned, and wet down. Then the surface should be slushed with a coating of cement grout and the new concrete placed before the grout has begun to set. Where fresh concrete must be bonded to hardened concrete, many builders prefer to install a mastic sealer-type of joint. The old and new sections should be keyed together by embedding a chamfered strip in the plastic concrete, rather than by cutting a keyway in the hardened concrete.

Hand spading, rodding, tamping or mechanical vibration will place and compact the concrete satisfactorily. Mechanical vibration works especially well with mixes stiffer than those ordinarily placed by hand.

Curing is a particularly important step in swimming pool construction. Proper curing reduces shrinkage of the concrete and increases its strength and watertightness. The exposed surfaces should be kept moist for at least 7 days, and in some cases, twice that long.

Small pools for residences and for hotels and motels account for the majority of pools built each year. In 1958, nearly 80 per cent of these pools ranged in size from 15 by 30 feet to 20 by 40 feet. Private and semi-public pools are more likely than the larger municipal pools to be of the round, oval, or free form shape.

The use of flexible, reusable forms of steel or wood has made it possible to cast various curved shapes with concrete. However, in any shape plastic concrete exerts considerable pressure against formwork, which must therefore be as rigid as possible to prevent uneven wall surfaces. Curved forms to construct kidney and similar shapes will need special cross-bracing.

Reinforcing steel for a small pool need not be as heavy as for a large one. As a rule, ⅜-inch diameter intermediate grade billet steel on 6- to 12-inch centers is adequate. Some of the vertical rods will be bent and tied into the bond beam. These rods should be ½ inch in diameter and somewhat longer than the others.

Forms for small pools should be set for casting walls at least 8 inches thick; floors should be at least 6 inches thick. Because of their size, small pools are often cast monolithically, dispensing with expansion and construction joints. Often the floors curve into radius corners instead of meeting the walls at 90 degrees. In the deeper parts these curves are often as much as 30 degrees. The walls in the deeper parts are placed first and the bottom of the inside forms left open. The concrete is dammed until it stabilizes and the excess mix is used to begin the curve in the floor. Concrete for the floor is dumped directly into the excavation, spread with shovels, and worked in with the concrete at the base of the walls. The corners will have

NUMBER OF POOLS BY AREA

	Jan. 1956	Jan. 1958	Jan. 1960
Pacific Coast	29,000	62,400	102,400
Texas & Mid-South	9,000	21,900	45,900
Arizona, New Mexico & Mountain States	3,200	5,900	15,600
Florida	3,800	10,100	24,500
Midwest	5,000	15,000	30,000
East	6,000	17,700	35,800
Totals	56,000	133,000	254,200

VOLUME TREND. For seven consecutive years the number of pools constructed has increased by one-third each year; the dollar volume by 25 percent. In 1959 more than 70,000 in-the-ground pools were built, of which 46,200 (or about 2 out of 3) were residential. Trade estimate for 1960 is for 85,000 new pools at a volume of about one billion dollars. Estimates for 1970 run as high as 250,000 installations.

about an 8-inch build up.

In cases where the floor is cast before the walls, the addition of a plasticizer will retard setting sufficiently to permit a monolithic pour. Many builders cast a one-foot high section of the walls before casting the floor. They then unite the bottom of the wall with the floor and complete the wall.

After the forms are removed and the plumbing completed, the walls should be trimmed. At this point, the skimmer opening can be cut in, if it was not provided for earlier by a wooden frame fitted between the forms. Equipment to keep the water clean is fitted in the skimmer opening. The pool is then backfilled and the placing of the bond beam completes the construction.

Pneumatic application is believed to account for about 60 percent of the pools constructed with concrete. This technique requires forms only for the bond beam. The reduction in formwork represents a considerable saving in labor and materials, but this advantage is at least partially offset by the special equipment and the skilled craftsman required to do the job. Pneumatic application should be limited to soils that can be shaped to the contour desired and which will retain the shape until the work is completed.

In shaping an excavation for applying concrete pneumatically, the excavating equipment should not remove the final 6 inches of soil around the edge. Finishers begin work with shovels and mattocks to smooth and trim the excavation once the equipment has reached a depth of two feet. The excavating machine then can remove all loose material before it leaves.

While finishing is in progress, forms can be laid for the bond beam. The bond beam forms mark the level of the pool and guide the operator. These forms must be absolutely level.

If the excavation is in unstable material such as fill or sand, it is wise to give it a flash coat of concrete before laying the reinforcing steel. Many builders prefer ⅜-inch deformed steel on 12- to 16-inch centers. The steel is extended to the top of the walls. One-half inch rods are best for reinforcing the bond beam and for the rods to be tied into the pool deck. The vertical bond beam reinforcers are often bent to form a stirrup around the horizontal rods. Beyond the 4-foot depth, it is a good idea to add vertical wall rods to have reinforcement on 6- to 8-inch centers. There should be 2 inches of clearance between the steel and the earth.

For additional floor strength, 6- by 6-inch 10-gage mesh reinforcing can be laid and extended well into the corners before the steel rods are placed. All rebound must be removed from under the reinforcement to prevent weak spots. A layer of crushed rock under the reinforcing will keep workmen from tramping the steel into the soil. It will also aid drainage under the pool and provide a firm, level base on which to spray the concrete.

Concrete for pneumatic application is a dry mix and, properly applied, it slumps very little. But the texture is rough and hand finishers must begin work as soon as the placing crew leaves.

Besides troweling the walls and floor, finishers have other responsibilities. They must clear the light niche and dry pack any small crevices that appear. They must also cut the skimmer opening.

The dry, or hand-packed pool is the third type which may be constructed with concrete. These pools can be built without forms, or with forms which simply cover the top 2 or 3 feet of the walls. Concrete slump will prevent the construction of truly vertical walls on a dry packed pool. But if no forms are used, the concrete will slump to a 10 percent grade or more.

Only inside steel or wooden forms are used. The sides of the excavation serve as the outside forms. To keep the floor area clear for workmen, the 2- or 3-foot deep forms should be supported by beams at grade level. Forms of this type are difficult to handle if they are more than 20 feet long because of the possibility of sag which will produce irregular walls. Consequently forms are usually impractical for dry packed walls more than 20 feet long.

The placement of reinforcing steel for a dry packed pool with forms is essentially the same as for a conventionally cast pool. The steel should be 3 inches away from the earth.

A 1:2:3½ mix with 4½ to 5 gallons of water per sack may be used, although the exact proportions will be influenced by such factors as the type of soil and the temperature. The crew must pack the mix against the excavation up to the bottom of the inside forms. Beyond the 4- or 5-foot depth, the crew will have to stack the concrete with shovels. Dry packed walls should be 8 inches thick and the

PRICE AND SIZE TRENDS. Today the average selling price for a residential pool is $4,160, down somewhat from a year ago. Nine out of 10 residential pools built in 1959 were 20 by 40 feet or smaller. A trend towards pools 15 by 30 feet and smaller is now in evidence, with prices ranging from $2,500 to $5,000, fully equipped. In general it is believed sound to limit the investment in a residential swimming pool to 15 percent of the value of the house.

floor should be at least 6 inches thick, with 10- to 12-inch buildups at the corners.

The shaping crew works each load as it is dumped directly into the excavation, shoveling and compacting the concrete to eliminate all weak points and air holes. Slump becomes a problem past the 5-foot mark. It is best to stack the concrete with the shovel turned upside down in order to pack the mix firmly and achieve an even wall build up.

As the shaping crew works past a section, finishers take over to trowel the concrete smooth. The hand packing crew will be working on the floor as the finishers complete the walls.

When the walls have been stacked to the bottom of the forms, concrete is placed directly into the forms to complete the top. If this is done while the wall concrete is still workable, there should be no danger of a cold joint forming. If the concrete has set, then a coating of cement grout should be applied first.

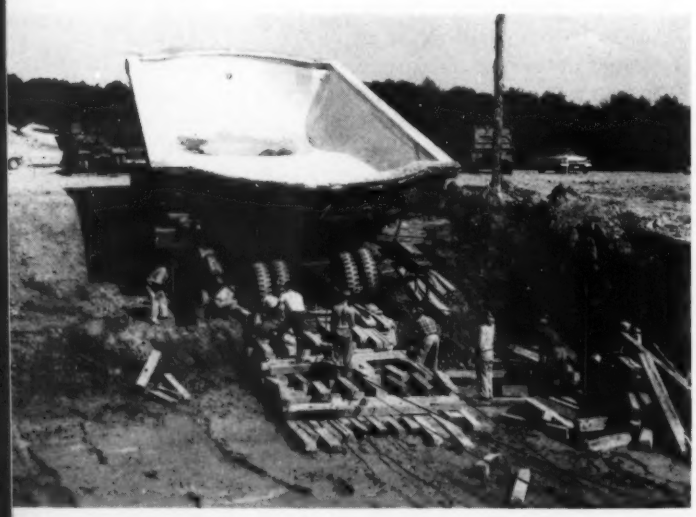
Some buyers prefer a dry packed pool with definitely sloping walls to give the pool a bowl-like shape. In such cases, forms are needed only for the bond beam. The excavation is finished in the same way as one for a Gunite pool and reinforcing steel placed in a similar fashion. Then the concrete is placed and worked down the sides and across the floor. The concrete is troweled as the job progresses. Casting the bond beam and curing the concrete completes the job.

Concrete pools of all sizes and types usually go through one final step before they are ready for use. The walls and floor are coated with paint or plaster.

Which of the three methods of building pools with concrete is best? That depends on the buyer's desires and needs, site conditions, and the builder's equipment and experience. For large pools cast concrete has definite advantages. For small and medium sized pools, any one of the three methods will give good results if the work is carefully done.

One thing appears certain: the demand for pools will continue strong. The movement to the suburbs, increased income, and the American liking for outdoor recreation will see to that. END

Readers who would like to have additional information related to the subject discussed in the foregoing article may request it by circling No. 142 on one of the postage-paid reader service cards in this issue.



Concrete Pool Takes to the Road

The permanence of concrete for swimming pools was dramatically demonstrated not long ago when this 92-ton pool was uprooted and moved half a mile to a new location in a suburb of Cleveland, Ohio. After 2½ weeks of digging out, the actual move took only 5½ hours. The 24- by 48-foot shell consisted of a poured concrete floor with Gunite cove and walls. The move was accomplished without any damage to the shell, and at a cost of $8000 — $5000 less than the cost of a new pool. Frank Mural & Son of Cleveland did the moving. The original installation was by Central Paddock Pools Corporation of Cleveland.

Full-Depth Control Joints For Concrete Highway Pavements

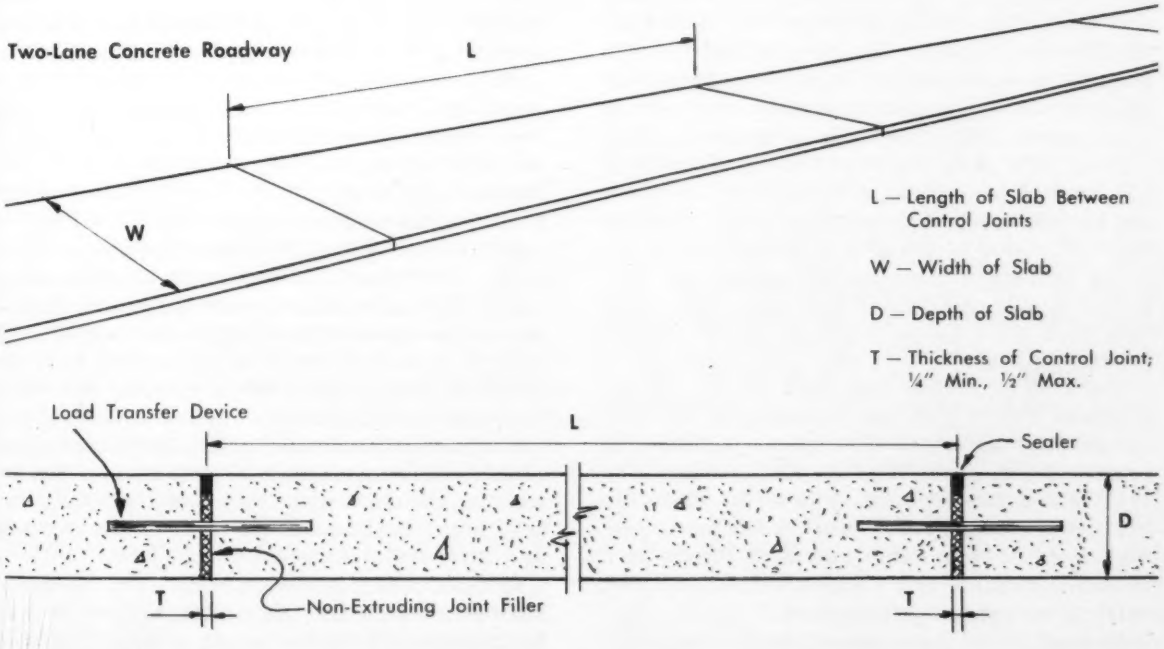
Earlier this year Concrete Construction Magazine published an article which briefly described the programs of some of the important technical societies and trade associations which directly serve the concrete construction industry. Through an oversight the article failed to include information concerning the Concrete Joint Institute, an association of manufacturers of concrete joint materials with offices at 360 North Michigan Avenue, Chicago.

The Institute has recently proposed to the various states that either independently or in cooperation with the Bureau of Public Roads or the Highway Research Board they undertake specific comparative test projects to determine the engineering and economic merits of a full-depth control joint in highway construction. This account of the proposed control joint program is published here to acquaint readers of Concrete Construction Magazine with the Institute and to encourage the broadest possible consideration of a proposal which seeks to improve methods of jointing concrete pavements. The information presented here has been transmitted to the engineering personnel of the highway departments of all 50 states.

THE FULL-DEPTH CONTROL JOINT is basically a combination expansion-contraction joint between ¼ and ½ inch in thickness and having a depth equal to the full depth of the slab into which it is built. It incorporates standard load-transfer devices and makes use of non-extruding resilient fillers and hot-poured sealers. Among the advantages claimed for the full-depth control joint is the elimination of the costly operation of sawing joints, along with the attendant problems of timing; the reduction of curing cracks to a minimum level; and the control or elimination of such additional trouble sources as the following: random or unwanted cracking between joints; plane-of-weakness contraction joints and the haphazard cracking that accompanies the formation of such joints; and the creation of joints which are either too wide to retain an adequate seal or too narrow to be sealed and maintained as joints.

The elements of the full-depth control joint system which the Concrete Joint Institute is suggesting are shown in Figure I. It is pointed out that the system should not add significantly to pavement costs, since the use of load transfer devices is now rather widely accepted for most joints, even the weakened plane type. Load transfer devices

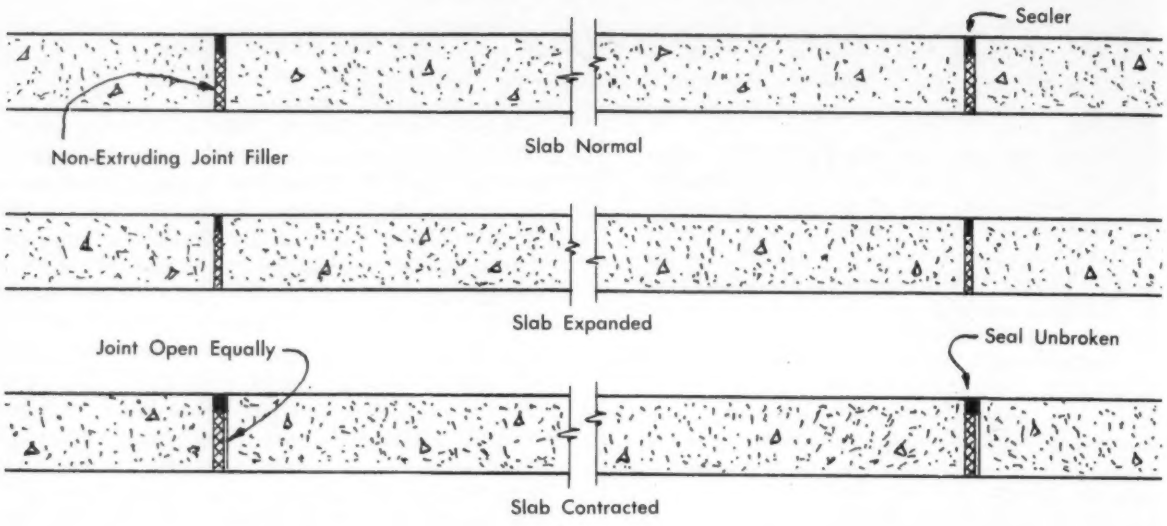
FIGURE I — FULL DEPTH CONTROL JOINT SYSTEM



Longitudinal Section

FILE: Joints

FIGURE II — FULL DEPTH CONTROL JOINTS



have proved to be one of the most effective means of minimizing the serious effects of pavement warping.

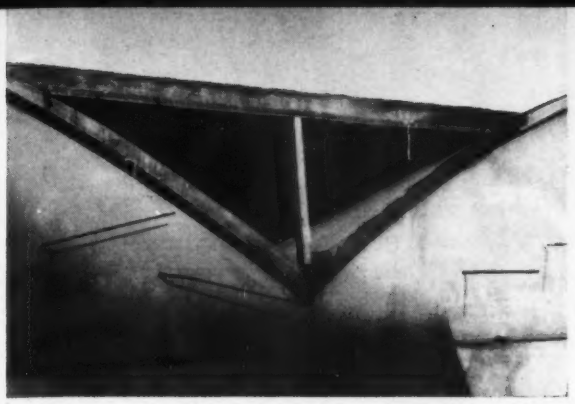
The Institute believes that the full-depth combination expansion-contraction joint will result in extended service life for concrete pavements and reduced annual expenditures for maintenance. It is believed that the proposed thickness of ¼ to ½ inch will result in joints which are narrow enough to prevent wheel bump and yet wide enough to permit proper sealing. Figure II shows how this type of joint should function to maintain an unbroken seal when the slab is expanded and when it is contracted. The Institute believes that joints of this type will open equally and that all such joints in a pavement will have equal freedom of movement. The Institute's proposal to the highway departments of the various states points out that joint spacing with this type can be adjusted to suit local design criteria, and that joint thickness can readily be varied in accordance with temperatures prevailing at the time of construction.

The Institute's memorandum points out that a great deal of new information has become available since the Highway Research Board's six experimental projects were started 20 years ago — projects which became the basis for the Board's Research Report 17-B, Joint Spacing in Concrete Pavements, published in 1956. On the experimental projects set up by the Highway Research Board in 1940, the minimum spacing between expansion joints was 120 feet, and in most of the participating states the joints were 1 inch thick. There were also some sections, up to a mile in length, on which only contraction joints were used.

On sections of pavement in which expansion joints were spaced 120 feet or more, with contraction joints in between, it was found that the expansion joints tended to close over a period of time, while the contraction joints become progressively wider. Where contraction joints alone were used, some joints opened more than others. When incompressible foreign material entered such joints and the concrete subsequently expanded, unequal stresses inevitably caused cracking and spalling.

The proposal of the Concrete Joint Institute aims at developing a method of jointing concrete pavements which falls somewhere between the extremes represented by HRB's 1940 experimental projects and the admittedly conservative but surprisingly sucessful jointing practice which was developed after World War I, when joints of ½ inch or less, spaced from 15 to 25 feet apart, first came into general use. Among other objectives, it is hoped that new studies utilizing today's superior knowledge may free designers from the limiting effects of the sharp differentiation between expansion joints and contraction joints.

The Concrete Joint Institute's specific proposal is that comparative test projects be constructed consisting of a moderate length section of divided interstate highway (two separate roadways) lying between two structures. One-half of each roadway would be built in accordance with the standard interstate design currently in effect in the state in which the study was being made. The other half of each roadway would be identical in all respects, including joint spacing and load transfer devices, except that all contraction and expansion joints would be replaced by full-depth control joints ¼ to ½ inch thick. Comparative data would be accumulated on construction and maintenance costs, performance, and projected length of service for the two pavements. END



To reduce air friction, duct valleys were given a smooth steel trowel finish. Wooden supports were later replaced by steel posts to prevent deflection in insulated duct cover. Addition at rear of building was later integrated with steel dowels seen in picture.

STRUCTURAL CONCRETE DOUBLES AS DUCT SYSTEM

Wall panels precast on floor slab were integrated with diaphragms and thin shell barrel vaults to build this bowling alley. Shell valleys, skirting two sides of center area, were covered to create an economical concrete duct system to supply air to the center portion of the building.

STRUCTURAL CONCRETE constitutes the major duct system for the heating and cooling installation in a new bowling lane in Tulsa, Oklahoma.

The 27,000-square-foot building consists of 9 thin shell concrete barrels. Ducts are located in the valley between barrels, with the sides of the barrels forming two sides of a triangularly shaped duct. Thermo-board of 1-9/16-inch thickness and 4-inch vermiculite, 1 : 6 mix, make up the duct roofs. All shells and ducts are covered by a 4-ply membrane roof. To prevent deflection, metal supports are set in the duct valleys.

To reduce air friction, the two valleys which are used for ducts were given a smooth, steel trowel finish. To give an even denser surface, a topping of cement and screened sand was worked in during the finishing process. The design engineer calculated the friction factor of the concrete as approximating that of sheet metal. However, duct areas were increased 10 percent to compensate for loss of air velocity due to increased friction loss.

The bowling lanes are located at each end of the building, so only the central area, containing bowler seating, grill and office, is heated and cooled. The concrete ducts flank two sides of the central area. Air is ejected from vents along one face of each duct. Air is returned to handling units through louvered doors.

Haydite wall panels, 6 inches thick, were site cast on the floor slab and tilted into place after curing seven days. These wall sections were integrated by means of steel dowels and concrete placed between panels. Diaphragms, cast above each panel, were also tied in with steel dowels. Barrel vaults, three inches thick at the peak and four inches thick at the valley, fit over the diaphragms.

Each shell vault was cast in one day. Shells are reinforced with 4 by 12 5/10 welded wire mesh, with a double layer of mesh extending two feet on each side of valleys. Reinforced concrete columns placed at the mid-section of each valley give support to the shells. These columns are joined by tie beams spanning each shell.

Specifications called for 3,500 psi concrete at 28 days and for 2 to 6 percent of air entrainment. Concrete delivered to the job averaged 4 percent entrained air. Slump of concrete was 4 inches. The total concrete contract, including walls, footings, floors, barrel shells and roofing, amounted to $115,000. END

SLIP FORM MACHINE FOR CATTLE FEED TROUGHS

View from in front of the forming machine shows winch and cable by means of which the assembly is pulled along the outer forms. Reinforcing rods visible on the subgrade are automatically positioned in the walls as the device moves along.

ANOTHER* INGENIOUS EXAMPLE of the use of slip forming to speed up the casting of concrete on the job site is a cattle feed trough forming machine developed by a Colorado contractor. The machine creates a dense concrete which is especially effective in resisting attack by the acids which are almost always present in the feeds used for cattle.

As shown in the accompanying pictures, the machine is self propelled by means of a 5-hp gasoline engine which winds a 7/16-inch cable on a winch drum. The cable is anchored to either a dead man or a tractor. In addition to a concrete feed hopper and a steel mold conforming to the cross section of the bunker, the assembly also includes a small generator which produces electrical power to operate the internal vibrators which fill the form and consolidate the concrete. The machine automatically trowels all but the top edges of the walls.

The troughs are 3 feet wide by 2 feet deep, and the exterior wall faces are molded by means of stationary re-usable plywood forms which also provide the tracks upon which the slip forming device runs. Approximately 200 feet of the stationary forms are set up, usually on the afternoon of the day preceding casting operations, in preparation for the actual placing of concrete. The bottoms of the exterior forms are held in place with steel stakes, while the tops are supported by means of rollers built into the slip forming machine to control the width as the device moves along. The walls are kept from spreading by means of clamps which are dropped into position at frequent intervals as the machine traverses the length of the forms.

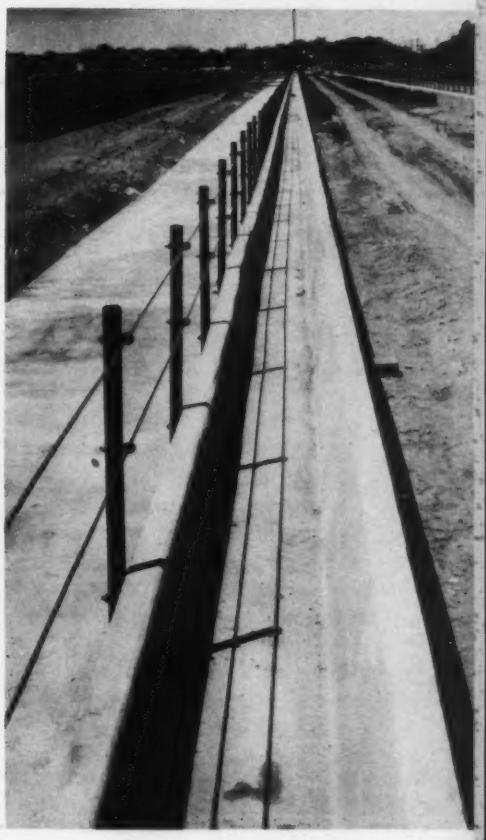
Four No. 3 steel reinforcing bars are fed into the front of the machine and automatically positioned in the walls of the trough as the machine moves.

According to Allen Yost, the Sterling, Colorado, contractor who developed the machine, the device makes it possible for a 4-man crew to cast 200 feet of feed trough and apron in a normal work day. Casting operations begin in the morning utilizing the formwork set up and prepared the previous day. Using ready mixed concrete to supply the machine hopper, the full 200 feet of trough can be cast in about 2½ hours. Each cubic yard of concrete accounts for about 9½ linear feet of trough. When this portion of the work is completed, the crew then places concrete for an apron adjacent to the feed trough. This is simply a 4-inch slab from 6 to 12 feet in width to provide a clean, solid footing for the cattle. By the time the apron has been completed, the concrete in the slip-formed trough has set sufficiently to permit stripping and resetting the stationary forms for the next day's work. END

*See "Casting Concrete Pipe in Place," Concrete Construction, March 1960, page 68.

FILE: Forming

RIGHT: This is how the feed trough and apron look when completed.



BELOW: Close-up of the slip forming machine which is self-propelled along top of stationary outer forms while it molds, compacts, reinforces and trowels the concrete for the walls and floor of the feed trough.

Mr. Allen Yost—author of the accompanying article—is a member of the National Concrete Contractors Association, and in writing us, stated his hope that it would stimulate the urge among contractors to share their knowledge and unite their efforts through the national organization:

"I sincerely hope that the slip-forming machine and operation discussed in my article, will benefit contractors wherever it can be used to fill customer needs.

As a member of the NCCA, I firmly believe that helpful communication must be promoted among contractors everywhere to help introduce new methods and practices and to raise the industry's standards in general. We can do this best through the NCCA."

Readers who would like fuller information on membership in this association should write to the National Concrete Contractors Association, 6737 South Chicago Ave., Chicago 37, Illinois.

HEAVY HUMOR

. . . 6 TONS OF IT

Susan Nelson tugs vainly at door of automobile belonging to her father, Joseph Nelson. A truck driver friend, Bob Porter, admitted he dumped the concrete into Nelson's car when he found no one at home to accept delivery.

FOR REASONS too obvious to require listing, this magazine is constantly on the alert to note and encourage new uses for concrete in general, and for ready mixed concrete in particular. It's our job and we enjoy doing it.

The two pictures on this page undoubtedly qualify as grist for our mill. They show what happened in Denver not long ago when the driver of a ready mixed concrete truck showed up at the home of a former friend to deliver a load of concrete for a driveway and patio. Finding nobody home, he waited for what seemed to him a sufficient length of time, and then gave vent to his understandable exasperation by unloading six tons of ready mix into the absent home owner's family car.

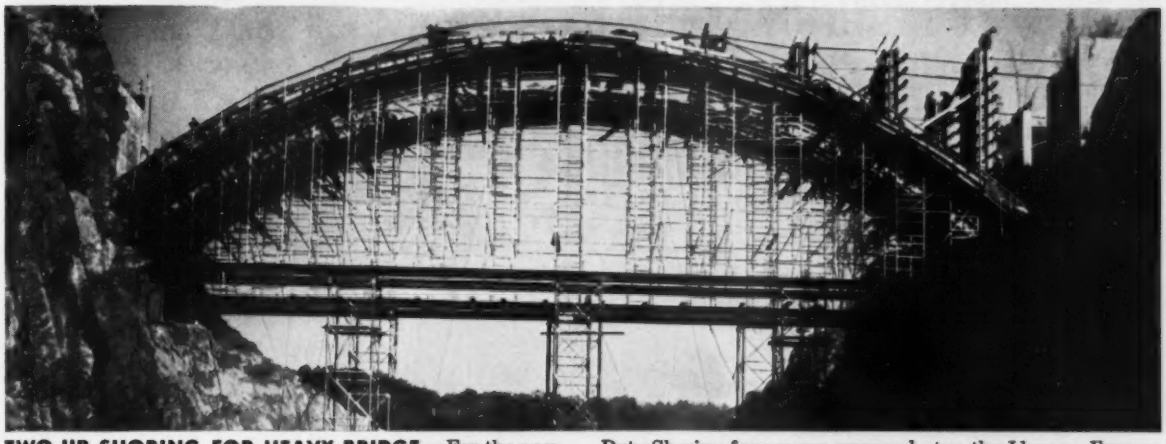
The pictures show more graphically than words the end result of this imaginative sabotage. In the one view the car owner's 8-year-old daughter tries in vain to open a door, while in the other the owner himself studies the interesting and challenging problem which confronted him when the other door was opened.

This basic situation, with a somewhat different background, has actually been in the news a good deal lately. We've seen a dozen versions, with datelines from all over the United States. In most of them the driver of the ready mix truck has been assigned a delivery close to home, so he decides to drop by for a cup of coffee with the distaff side of the household.

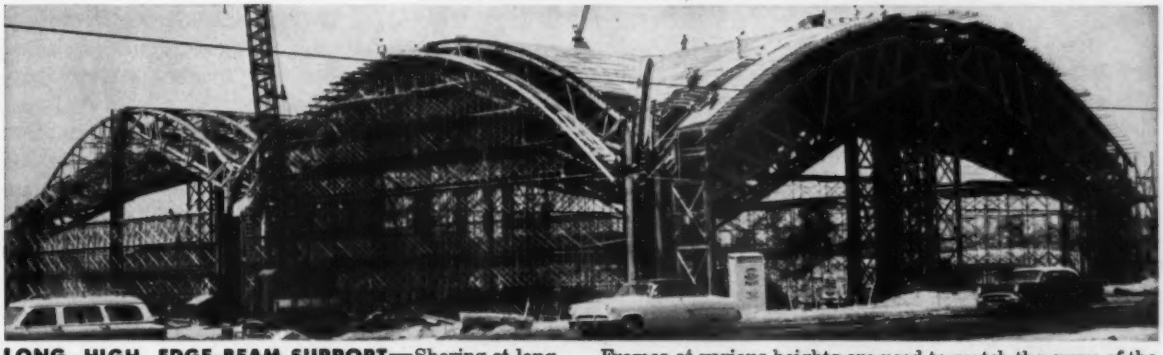
Finding her engaged with a strange male visitor, our hero withdraws quietly and tactfully to consider the situation. When he finally has it all figured out to his satisfaction, the beast in him gets out of hand, and he decides to even the score by chuting his load of concrete into the interloper's car parked at the curb.

In a nation of compulsive enthusiasts, there's no telling how far an idea like this may go before people lose interest in it. After all, flag pole sitting, navigating Niagara Falls in a barrel, swallowing gold fish and stuffing people into phone booths have all had their day, and certainly chuting concrete into parked automobiles isn't much crazier than any of these activities. And there must be lots of empty cars parked in front of houses. . . . END

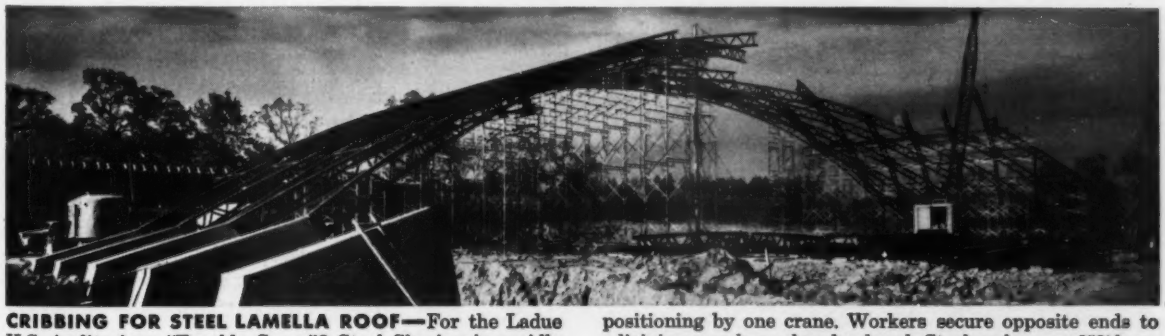
Shoring Methods . . . by PS CO.



TWO-UP SHORING FOR HEAVY BRIDGE—For the new, 143′-long concrete bridge at Hogback Dam, Riverton, Conn., PS CO. Extra Heavy Duty Shoring is first assembled in 6 towers, 48′-high to carry a total load of 32,000 lbs. per leg. I-beams are set on top. Then "Trouble Saver"® 4′-wide Heavy Duty Shoring frames are arranged atop the I-beams. Frames support 9,000 lbs. per leg, imposed by columns and two ribbon arches 8′-wide by 1½′ to 3′-thick, 34′ center height. White Oak Excavators, contractor.



LONG, HIGH, EDGE-BEAM SUPPORT—Shoring of long, concrete edge-beams, 22″-wide by 4′-thick, varying from 140′ long by 70′ high to 150′ long by 75′ high, is easily accomplished with standard "Trouble Saver"® Sectional Steel Shoring. Frames of various heights are used to match the curve of the beams. Gilbane Building Company, contractor, for the first fully mechanical Post Office, Providence, R.I. Building is to be 420′ by 300′.



CRIBBING FOR STEEL LAMELLA ROOF—For the Ladue H.S. Auditorium, "Trouble Saver"® Steel Shoring is rapidly assembled in towers to form temporary cribbing during erection of steel girders of the lamella-type roof. Shoring towers, with frames spaced 5′ apart, are placed to hold girders during positioning by one crane. Workers secure opposite ends to adjoining members already placed. Steel arches are 252′-long, abutment to abutment, center height 50′. Christina Constr. Co., gen. contr., Kroeger Erection Co., steel erectors.

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Now finish a complete foundation in 16-24 man hours with only 3 men! Simplex Forms go up with ease. Inner and outer forms are "keyed" for speed . . . are set simultaneously. Tie rods are quickly positioned . . . patented locking levers are tapped in place; exclusive cam action draws panels tight.

POUR FASTER

Simplex Forms are strong! Their rigid assembly permits fast pouring. Pour at one corner or four corners at a time. Vibrating concrete won't shift or loosen forms as they are locked firmly in place. Each panel automatically adjusts to the condition of the footing.

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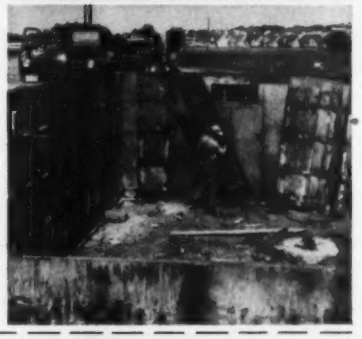
Simplex Forms are 1⅛" plastic-impregnated (9-ply) plyglaze. This insulates in winter . . . easier to handle than steel in summer. Forms are unlocked by tapping levers upward . . . forms are easy to lift (2' x 8' forms weigh only about 65 lbs.). Because locking hardware is bolted to each form there are fewer man-hours required to strip and move. A complete set of forms and accessories can be moved on a 12-foot bed truck! One trip between jobs.



SMOOTH, ACCURATE WALLS

Simplex Forms produce walls with the look of architectural concrete. Because panels are drawn together snugly, seam marks are minimized . . . positive wall dimension is assured! This means accuracy that counts in customer-satisfaction, home salability, and surer erecting—especially of pre-fabs.

THE WORLD'S FASTEST METHOD **Simplex** FOOT-A-MINUTE **forms** OF CONCRETE FORMING

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new research laboratory

One of the newest pieces of testing equipment to be installed in the new Master Builders Company research and technical center is this 90,000-pound concrete testing machine. Inspecting the new device are Herbert K. Cook, vice-president for engineering; Thomas M. Kelly, vice-president for research; and Stephen W. Benedict, president of Master Builders.

Dedicated to the research and development of products to improve concrete and supplemental research on concrete and all concrete ingredients, the new scientific center is the most recent development in the firm's 50-year history of research and technical service to the construction industry throughout the world.

Heart of the center is the concrete laboratory where investigations of admixture formulations, cement, aggregates and mix proportions are conducted. A research chemistry laboratory, a test equipment development laboratory, the engineering department dispenser evaluation test room, a research physical laboratory, a materials analysis laboratory, the engineering department physical laboratory, a thermal laboratory and a balance room complete the facility.

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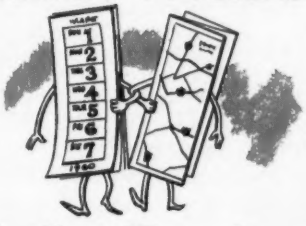

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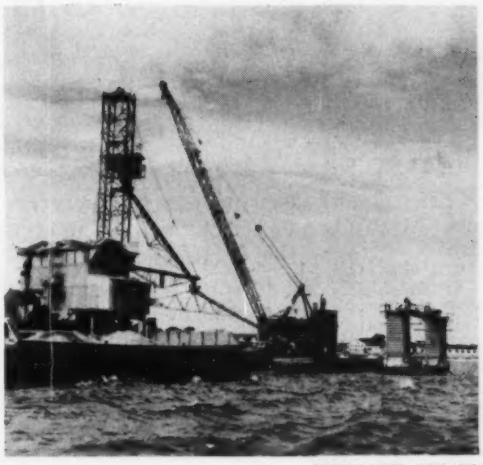
Throgs Neck Bridge - Owner: Triborough Bridge and Tunnel Authority; Consultants: Ammann & Whitney, Emil H. Praeger, E. Lionel Pavlo; Contractors for Substructure Merritt, Chapman & Scott Corp., Steers-Snare Joint Venture, Fehlhaber Corp.; Contractor for Paving: Horn Construction Co. and Queens Structures Corp. **Verrazano-Narrows Bridge** - Owner: Triborough Bridge and Tunnel Authority; Consultants: Ammann & Whitney, Emil H. Praeger; Contractor for Tower Piers: Steers-Snare Joint Venture.



THROGS NECK, JULY 1959

THROGS NECK, JULY 1960

VERRAZANO-NARROWS, JULY 1960

VERRAZANO-NARROWS, JULY 1960

PLASTIMENT reduces shrinkage, controls rate of heat development

The two largest suspension bridges now under construction in the United States, stand on Plastiment concrete substructures. The Verrazano-Narrows Bridge, connecting Staten Island and Brooklyn, will ultimately span 4,260 ft. between towers to become the longest suspension bridge in the world. The nearly completed Throgs Neck Bridge spans 1,800 ft. between towers and stretches 2,910 ft. between anchorages on Long Island and the Bronx.

Plastiment Retarding Densifier reduced the rate of internal heat development in massive sections of the critical substructures and reduced shrinkage. The use of Plastiment in the tremie concrete improved flow characteristics and minimized the development of laitance. Rapid strength gain was a bonus to the contractor.

Plastiment features are detailed in Bulletin PCD-59. Ask for your copy. District office and dealers in principle cities; affiliate manufacturing companies around the world. In Canada, Sika Chemical of Canada, Ltd.; in Latin America, Sika Panama, S.A.

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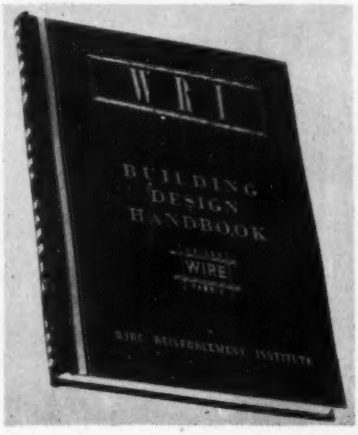
books

Publication of the new WRI Building Design Handbook, has been announced by the wire reinforcement industry through its national trade association, the Wire Reinforcement Institute, Washington, D. C. The book is intended for use by designers, engineers, architects, consultants and others concerned with reinforced concrete construction.

The new 168-page handbook is divided into two parts. The first part consists essentially of general text and pictures describing the ways in which steel wire fabric is put to effective use. Tables, sketches and detail drawings are included to help the



design engineer and his draftsmen. Also in part one are several case histories of projects in which wire fabric has been used to particular or unusual advantage.

The second part of the design handbook deals primarily with the rapidly widening use of heavy welded wire fabric. Since it consists principally of a series of actual design tables (with necessary explanatory text), it is expected to be a working tool in the actual design of structures. To make use of the tables more effective, several illustrative design problems are included.

The availability of heavy fabric with members in both directions up to ½ inch in diameter now

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Suggested for almost every type of joint installation. Offer low initial cost, great durability, and are completely waterproof. They are rigid and easy to install in perfect alignment . . . will not deform in hot weather or become hard or brittle in cold weather. Offer excellent compression qualities. Preformed of a bituminous material bound together in a tough, shock resistant mass with a fibrous binder and formed between two asphalt saturated felt liners which add strength and rigidity.

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Ideal for installation in residential, commercial, institutional and industrial floor slabs where resiliency and non-extruding properties are important. They have a high tensile strength, may be compressed to 50% of original thickness and will recover to 70% of original thickness . . . assures a tightly sealed joint at all times. Made up of a shock-proof mass of clean, regranulated cork particles uniformly combined with pure blown petroleum asphalt. This asphalt-cork composition is produced under heat and pressure formed between two asphalt saturated felt liners.

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Suggested for use on highways and airport runways with a rubber asphalt joint seal applied over the joint. Fibre joints are easy to handle and install. When compressed to 50% of its thickness it will recover better than 70% of original thickness. Made of a preformed material composed of durable cane fibres of a cellular nature, uniformly impregnated with pure blown asphalt to a weight of 35% to 50% of the entire mass. This impregnation waterproofs the fibres, but does not affect the natural resiliency of the expansion joint.

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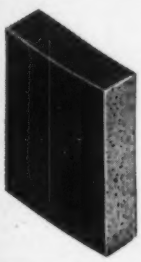
Sealtight Plain Cork Expansion Joints are composed of selected cork granules and molded with a resin binder. Suggested for use wherever it is essential that joints be kept filled at all times, such as in sewage plants, flood walls, water filtration plants, bridges, etc. They offer excellent resiliency . . . will compress without extrusion and recover to 95% of original thickness. Available in cut sizes or slabs.



GRAY SPONGE RUBBER EXPANSION JOINTS

Gray color provides a joint that blends with the adjoining concrete. Ideal for use in residential, commercial, institutional and industrial installations where the joint will be visually exposed. Fully compressible . . . has a recovery rate over 95% of its original thickness. Offers low moisture absorption . . . is easy to handle in all temperature conditions and is non-extruding. Composed of a high quality blown sponge rubber of uniform thickness and density.

SELF-EXPANDING CORK EXPANSION JOINTS

Sealtight Self-Expanding Cork Joints are made of selected cork granules molded with a resin binder and specially treated to permit an expansion of as much as 50% over original thickness. It is fully compressible, non-extruding and very resilient. When installed, a self-expanding cork joint will keep the joint area filled even when the joint opens wider than original size. Available in cut sizes or slabs.

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permits the designer to use prefabricated sheets of wire reinforcement to counteract stress in two directions. Most of the fabric available in prior years has had heavy wires in one direction only, with the wires at right angles consisting of temperature steel and anchorage. It is just within recent years that the industry has developed machines capable of welding ½-inch diameter wires to each other. It is believed that the two-way mats of heavy wires increase the potential uses of wire fabric and make possible new economies in reinforced concrete construction.

In part two of the handbook are tables for one way slab design, with spans from 10½ to 21 feet in conventional concrete, and spans 10½ to 24 feet in lightweight concrete.

The two way flat slab tables, which afford the designer full use of heavy fabric's two way design capability, cover slabs of conventional concrete and of lightweight concrete, both with and without drop panels, up to 26 feet square.

Also in the handbook are tables for designers of tilt-up concrete wall panels for 2- and 4-point pick-up design, in both conventional and lightweight concrete. Other tables cover design of vertically spanned basement walls, cantilevered walls, and square individual column footings.

As an aid to the quantity takeoff man, complete instructions are given on detailing and ordering welded wire fabric, including a sample framing plan and schedules.

The new handbook will be made available without charge to all bona fide inquirers, requesting it on an organization's letterhead. The reader service card in this issue may not be used for this purpose. Address requests to Dept. BH-70, Wire Reinforcement Institute, 1049 National Press Building, Washington 4, D. C. ⊙

Fly Ash Gives Plenty of "Fine Fines" for Quick, Easy Placing, Smooth Finishing

The Modern Mix Employs Cement and Fly Ash for Best Results

Desired: a concrete mix that is easy to place and fills the forms completely — but does NOT require more water than usual to accomplish this.

Fly Ash with Portland Cement does it, yielding a concrete of superior quality, better in several ways than straight cement concrete, quicker and easier to finish.

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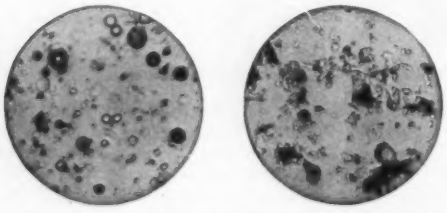
Fly Ash is a fine powder from pulverized-coal-burning power plants — largely spherical, smooth, glassy particles of silica and alumina, as fine as or finer than cement.



In addition to its chemical actions improving the concrete, Fly Ash increases the fine fines in the mix and literally gives it "ball bearings" that speed placing and finishing. In the highly magnified views above note the rough, irregular particles of cement (right) contrasted with the smooth balls of Fly Ash (left). They show why Fly Ash in the mix makes it "roll" into place better.

Fly Ash in the mix greatly reduces "honeycomb" effect, saves a lot of going back to the job to fix that condition. It makes a less porous concrete, less subject to cracking, more watertight.

Speeds the Building

Tests show one-day strengths ample for stripping where desirable. Strengths at 28 days and longer are often greater than those of straight cement concrete.

For Information–Help

Send for information on correct proportioning of Fly Ash mixes. Your established ready-mix concrete man can design the ideal mix for your work; can predict the 28-day strength to expect.

Each company below has staff engineers to assist you with data and technical help. Call or write:

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WEST PENN POWER COMPANY
Cabin Hill, Greensburg, Pa.

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MILWAUKEE FLY ASH, INC.
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Here's why we can make this offer!

● **New Roto-field electric motor** gives the vibrator more knock-down power than you've ever had on the job . . . and this high frequency power is variable so you can select the right speed for the mix.

● **Small diameter head sizes**—1¾" and 2⅜"—let you get into tight forms, tough-to-penetrate re-bar sections.

● **Unequalled maneuverability**—motor-in-head design lets you *forget:* limited length, hard-to-handle flexible shafts; hard-to-move gas engines; hard-to-lug, back-breaking electric motors.

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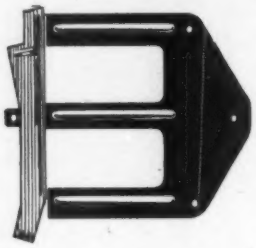

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The MODERN method of supporting walers on wood forms designed and engineered to give maximum performance and safety.

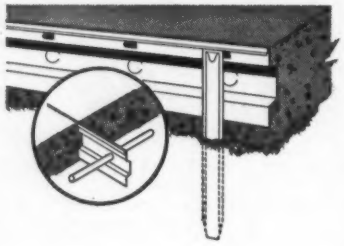
Vines Waler Brackets successfully support, space and retain walers independently of wall ties or clamps without toe nailing to studs and meet the requirements of the contractors and the safety engineer.

BURKE HANDY REEL

- Solid continuous aluminum frame.
- Self locking pin.
- Reversible belt loop for right or left hand workers.

Finger tight screw means:

No wrenches to use . . . no parts to lose . . . no threads to strip. Easy to rewind.



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A new concrete construction product that serves as form, screed, and true cold joint, left permanently in the concrete floor slab. The use of Keyed Kold Joint eliminates spalled joints . . . produces a cold joint structurally sound and architecturally beautiful. Keyed Kold Joint also eliminates costly make-up and stripping of split forms for checkerboarding. Saves up to 35% in cold joint form costs . . . results in neater, uniform joints.

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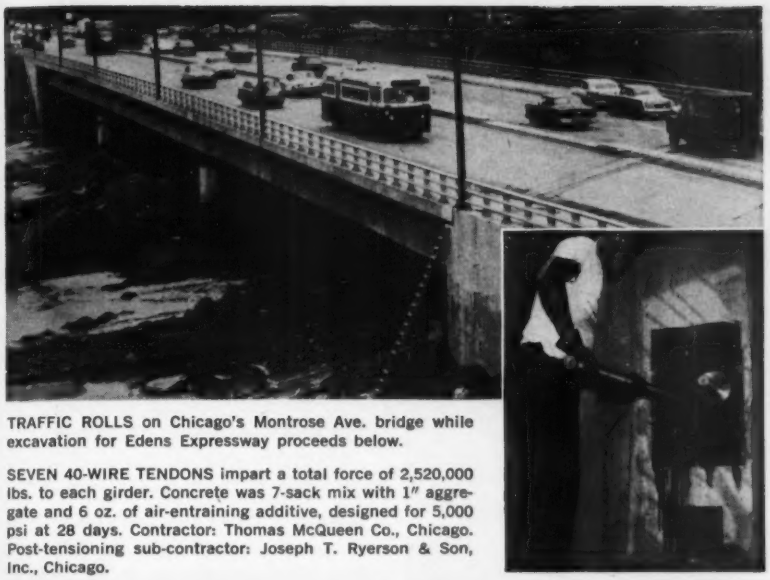
The Modern Building Encyclopaedia. *Technical Editor, N. W. Kay. Published by Philosophical Library, Inc., 15 East 40th Street, New York, New York. 768 pp. Illus. $15.00.*

Designed to cover the requirements of the contractor, craftsman, student and apprentice, this encyclopaedia contains nearly 4,000 alphabetical entries covering both the theory and practice of building. More than thirty experts, all of them specialists with considerable practical experience and many with wide experience as lecturers and instructors in their subjects, have contributed to the book. The scope of the work includes all the trades and professions associated with building and, in many cases, the manufacturing processes applicable to the materials used. Entries are not limited to simple definitions of terms, but in many cases include broad introductions to subjects like architecture, plastics, and prefabrication, while others describe the detailed work involved in operations such as arch construction, plastering and chaining. Tools used in various trades are listed under the trades. Entries on legal aspects of the building trades are included.

Physical and Chemical Properties of Cement and Aggregate in Concrete. Bulletin 239. *Published by Highway Research Board of the National Academy of Sciences—National Research Council, 2101 Constitution, Washington, D. C. 65 pp. Illus. $1.20.*

This bulletin contains three papers presented at the 38th annual meeting of the Highway Research Board and one paper presented informally at a conference session for discussion and review.

"Relationship of Pore-Size Distribution and Other Rock Prop-



TRAFFIC ROLLS on Chicago's Montrose Ave. bridge while excavation for Edens Expressway proceeds below.

SEVEN 40-WIRE TENDONS impart a total force of 2,520,000 lbs. to each girder. Concrete was 7-sack mix with 1" aggregate and 6 oz. of air-entraining additive, designed for 5,000 psi at 28 days. Contractor: Thomas McQueen Co., Chicago. Post-tensioning sub-contractor: Joseph T. Ryerson & Son, Inc., Chicago.

OVERPASS for Houston's Shepherd Drive is 2,100' long, curving to join existing bridge 1000' on either side of center. Memorial Drive underpass work is shown by arrow. Consulting engineers: Freese, Nichols, Turner & Collie, Houston. Contractor: Brown & Root, Inc., Houston.

→

36" CONCRETE columns, poured from above before underpass was excavated, act as cantilever supports for wall facing, which was poured after excavation.

ON MARK TWAIN Expressway, St. Louis, 2½" work slab, placed on natural ground, serves as a form for the two 39' bridge decks.

EXCAVATING revealed 3' diameter bridge columns, which had been poured direct from truck mixers into drilled holes in advance of bridge girders. Contractor: J. E. Latta Construction Co., Inc., St. Louis.

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Dig same solution to 3 bridge problems

1. CHICAGO: How to avoid hauling 154' concrete girders through traffic.
2. HOUSTON: Keep 50,000 cars a day moving during grade elimination.
3. ST. LOUIS: Eliminate expensive shoring and falsework.

ANSWER: Build the bridges on solid ground, then excavate beneath them for the roadways they are to span.

For Chicago's Montrose Ave. bridge over Edens Expressway, thirty 154' x 7' girders were cast and post-tensioned in exact final position before the expressway was excavated. Individual piers, on spread footings, were first poured into shaft holes; then the 10 lines of girders were cast in place upon them.

To build Houston's Memorial Drive underpassing two-level Shepherd Drive in a tight right-of-way, with minimum traffic interference, approach walls were poured in close-spaced holes and Shepherd Drive bridge deck completed on existing soil before excavating the underpass.

Where Mark Twain Expressway crosses St. Louis' planned circumferential Interstate route, a twin 252' box girder bridge was constructed on natural ground before excavating for the Interstate underpass. This saved shoring and falsework and cut construction time by two months.

Concreting was also simplified, direct pours being made by truck mixers of certified design, capacity, mixing speed and water control accuracy.

9 CUBIC YARD
MIXER
MAXIMUM CAPACITY
CERTIFIED BY THE TRUCK MIXER MANUFACTURERS BUREAU TO COMPLY WITH ITS STANDARDS FOR TRUCK MIXERS AND AGITATORS AS APPROVED BY THE N.R.M.C.A.
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UNLESS RATED LOWER ON THE MANUFACTURER'S DATA PLATE

You have a right to insist on this Rating Plate. It certifies compliance with the high industry standards which are maintained for your protection by the

TRUCK MIXER MANUFACTURERS BUREAU

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Chain Belt Company
Milwaukee, Wis.
Challenge Manufacturing Company
Los Angeles, Calif.
Concrete Transport Mixer Company
St. Louis, Mo.
Construction Machinery Company
Waterloo, Iowa
Hercules Galion Products, Inc.
Galion, Ohio
The Jaeger Machine Company
Columbus, Ohio
The T. L. Smith Company
Milwaukee, Wis.
Westinghouse Transit Mixer Division
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Plainfield, N. J.

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Cut costs on every job!

Whether you're using plastic or stiff mixes, Maginniss Hi-lectric Vibrators will place concrete faster and produce blemish-free finished surfaces.

Powered by a constant-speed 180 cycle 120 volt induction type motor located in the vibrator head for maximum efficiency, Hi-lectrics produce variable frequencies up to 10,500 V P M and maintain constant speed at all times—they do not slow down and lose vibrating effectiveness even under full load in stiffest low-slump concrete! This means you can use all purpose Hi-lectric Vibrators on any job, no matter what the concrete specifications may be.

Because pours are completed faster, labor expense for the entire crew is reduced. One-man operation cuts vibrating costs, too. The Hi-lectric power unit can be located as much as 200 ft. away from the work site—the vibrator operator is free to move about on the forms unhampered by cumbersome, unwieldy flexible shafts. What's more, with blemish-free surfaces, costly hand finishing is eliminated.

Ask your Maginniss distributor to demonstrate on your present job—he'll show you how Hi-lectric equipment can cut your concrete placing costs. You'll find him listed in the Classified Section of your telephone directory. AA-1826

Simple, rugged construction of Hi-lectric motor-in-head vibrators keeps maintenance costs at a minimum. There are no brushes, commutators or armature windings to burn out.

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erties to Serviceability of Some Carbonate Aggregates," by Carl L. Hiltrop and John Lemish, presents data whose development may ultimately lead to a description of a typical "poor" aggregate.

"Correlation Between Chemical and Mortar Bar Tests for Potential Alkali Reactivity of Concrete Aggregates," by Bernard Chaiken and W. J. Halstead, shows the necessity for use of both tests to characterize some aggregates.

"Silicification of Carbonate Aggregates in Concrete," by Ramon E. Bisque and John Lemish, shows more conclusive data on this theory than presented in a related paper last year. Substantiating data are claimed to show that silica is introduced into some carbonate aggregate from the cement paste.

"Cement-Pozzolan Reactions," by E. J. Benton, reports on studies undertaken to develop information which will eventually lead to establishment of better criteria for pozzolan, mix proportions and cement type to achieve optimum results.

Symposium on Effect of Water-Reducing Admixtures and Set-Retarding Admixtures on Properties of Concrete. *Published by American Society for Testing Materials, 1916 Race Street, Philadelphia, Pennsylvania, 250 pp. Illus. $7.50.*

The use of water-reducing admixtures and set retarders in concrete has grown continuously since their introduction over twenty-five years ago, with a present estimated usage in the production of 25 million cubic yards of concrete annually in the United States alone. Further indication of current interest is evidenced by the fact that ASTM Committee C-9 on Concrete and Concrete Aggregates and certain public agencies are actively drafting standard methods of test and specifications to govern the

watch
that
cold weather!

For quality concrete . . .
protect from freezing!

Give your concrete plenty of time to build strength in cold weather. Good insurance against slip-ups is having protective materials at hand and ready to use *before* the temperature drops.

The requirements for placing cold-weather concrete are important. And to emphasize them to your crews, display the colorful PCA poster shown at right.

It's one of a set of four that spell out simple points to remember for quality concrete under different conditions—hot weather, drying winds, etc. The four are yours for the asking! (Free in U.S. and Canada only.)

Quality Reminder posters, 22" x 17", 3 colors. Sets of 4 are free.

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A national organization to improve and extend the uses of concrete

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purchase and performance requirements of these admixtures for concrete.

The future of better concrete lies in an increased understanding of concreting materials and the best manner of combining them to produce the maximum in strength and durability.

This Symposium consists of ten papers and a summary. It is of interest to note that four of the papers represent the joint contribution of four principal producers of admixtures. The remaining papers were prepared by representatives of consumer interests, research organizations and the cement industry. Extensive tabular material, charts and references are included in this volume.

Bibliography No. 3 — Fatigue of Concrete. *Published by American Concrete Institute, P. O. Box 4754, Redford Station, Detroit, Michigan. 38 pp. $2.50.*

This bibliography lists and annotates 114 significant works published since 1898 on the fatigue of plain and reinforced concrete. ACI Committee 215, Fatigue of Concrete, searched major technical publications of many countries to compile the references.

Titles cover a wide range of concrete fatigue tests, including the results of studies made in compressive and flexural fatigue loading of plain and reinforced concrete and of the resistance of bond to fatigue loading. Investigations involving impact are not included. The references are representative of the historical background and reflect desirable current practices in the field of fatigue of concrete. To guide the user, annotations briefly summarize the important results of tests described in the references. Author and subject indexes are also included for easier reference.

Here's an Idea!

GAR-BRO helped cut costs in pouring concrete piers!

One contractor cut the time in placing concrete on this bridge job by planning ahead. Here, on these two bridge piers, note that he used three complete units comprised of Gar-Bro Collection Hopper and a string of Steel Chutes plus a Gar-Bro Bucket. He used the hopper and chutes to direct the concrete into the forms and prevent segregation.

His object was to prevent any delays by using one hopper and chute unit to place concrete in one pier, while the second one was set in place in the other pier, and the third one (see it hanging in rack between piers) was being shortened. Delays of transit mixers and the crane were minimized by rotating the hopper and chute units and shortening the chute line to the new level of the concrete in each pier.

It's a good idea to team up your Gar-Bro Concrete Handling Equipment to save time and cut costs.

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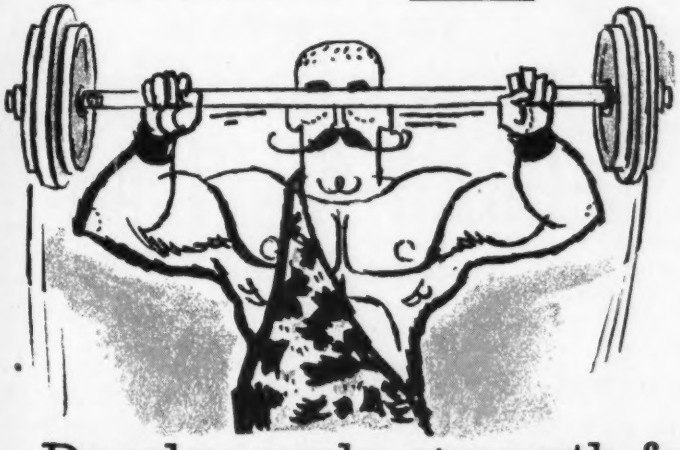
new forming techniques

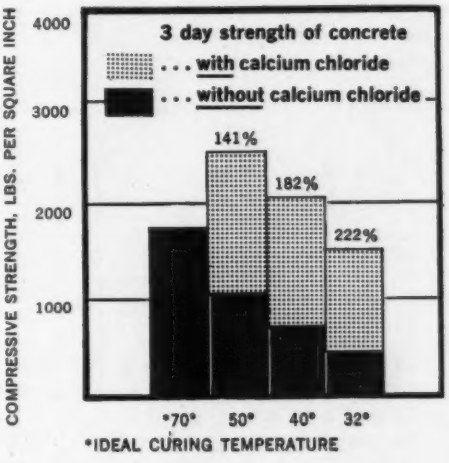
Two 10-story apartments in Chicago's Hyde Park district redevelopment involve some new and interesting forming techniques. Decks, mullions and spandrel beams of the two 470-7-inch by 56-foot buildings are placed monolithically. Custom aluminum frames and sash complete the walls. Wall-height forms are of face form fiber glass backed by 2 by 4's. Mullions and spandrel beams are 16½ inches thick from exterior to interior. One section of form is U.shaped for forming three exposures of the mullion and spandrel. A second section provides closure. Forms are wall height. Wall forming is completed by walers and bracing. Conventional plywood panels on steel supports are used for decks and interior columns.

No additional finishing on exterior surfaces is required since the plastic face produces a smooth architectural finish and U sections of forms eliminate joints and fins. The forms are light in weight, easily set and stripped and are readily cleaned by wiping with oiled burlap.

Total time involved in forming, placing and stripping of a 100- by 56-foot section of each deck by a 20-man crew is 1½ days. Curing time for each section is 3 days or less, depending on weather conditions. About 25,000 cubic yards of air entrained concrete will be used on the project.

At temperatures below 70°...





Develop early strength fast! Place concrete with **SOLVAY CALCIUM CHLORIDE**

A *40%* loss in the 3-day strength of concrete can occur when temperatures hover in the "danger zone" between 70° and 50°!

You can avoid this risk by adding only *2%* of Solvay® Calcium Chloride to your concrete.

Here's what you get—up to 50% shorter protection time . . . no overtime finishing . . . less delay in form removal and between operations . . . concrete that's *both* early and ultimately *stronger.*

For the full story, write Solvay requesting "cold weather concrete literature."

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1 APPLICATION:

CURES
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SEALS
DUSTPROOFS

Apply DEKOTE to freshly troweled concrete floors by spraying, brushing, or by roller, and you get a floor that looks better, is stronger, will last longer and be easier to maintain.

DEKOTE, as a curing agent, retains 95% of the moisture in concrete to assure positive, complete hydration for maximum strength and hardness. It effectively seals concrete surfaces against most acids, oils, greases, and other foreign materials. Objectionable dusting, usually found in untreated concrete is eliminated.

Paints and tile adhesives may be applied to DEKOTE-treated floors without removing the DEKOTE membrane.

DEKOTE is a clear, fast-drying material that imparts a smooth, natural lustre to concrete that makes it easy to maintain and clean.

For complete information and specifications on this new concrete floor treatment, write for DEKOTE T 130 Catalog Sheet.

TRETOL INC.

Quality Products for Concrete and Masonry

7252 W. 66th STREET, CHICAGO 38, ILLINOIS

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products

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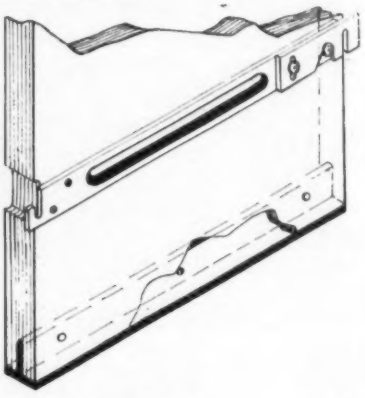
reinforcing 129

Three brochures devoted to welded wire fabric, prestressed concrete wire and prestressed concrete strand present complete technical information on each of the three products and include tables on load elongation and mechanical properties. The brochures also include reprints of ASTM specifications on the three products. Colorado Fuel & Iron Corp., Continental Oil Bldg., Denver, Colo.



steel bottom strip 130

A steel strip can be inserted and bolted to the bottom of each Simplex panel to prolong life of plywood and make panels better suited for stacking purposes. The steel strip is factory-installed on new forms on request. Simplex Forms System, 5605 Industrial Avenue, Rockford, Ill.

steel forms catalog 131

Bulletin 60-163 presents a line of curb, combination curb and gutter, sidewalk and flexible steel forms and describes features said to make these forms adaptable to many job requirements and to give excellent finished concrete work. In addition, the bulletin carries suggested specifications for curb and gutter and sidewalk forms and information on road and airport forms. Chain Belt Co., Milwaukee, Wisc.

An arch never rests.
—Hindu saying

FOUR WORDS, five syllables . . . and there is nothing to add.

These words cross my mind every time I see a bridge, or a skyscraper, or a home that has a fine, strong look of permanence about it.

They explain building codes, and structural design, and all the work that goes into making building materials better.

Calcium chloride is my business. Concrete strengthening is a big part of it. I think it's important work. And whenever I find myself doubting it (which is seldom) I just reflect on that Hindu saying . . . and am again convinced that a man who helps make a useful structure stronger is doing a pretty important piece of work.

Write for our booklet, "Better Concrete in Every Season with Wyandotte Calcium Chloride." It's short on philosophy . . . but long on facts. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

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HEADQUARTERS FOR CALCIUM CHLORIDE

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products

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vapor seal 132

Catalog 1660 presents a technical discussion of the need for a true vapor seal in modern construction and covers application information, specifications and installation data on Sealtight "Premoulded Membrane" Vapor Seal which the manufacturer claims fulfills all these needs. W. R. Meadows, 26 Kimball St., Elgin, Ill.

hand cleaner 133

Designed specifically for use in the concrete industries, a hand cleaner available in a wall dispenser is said to remove cement particles even though they are ground into the skin with other soil such as oil and grease. The cleaner contains an anti-bacteriological agent and lanolin and will help to prevent chapped hands and dermatitis. Edick Laboratories, 2358 S. Burrell St., Milwaukee, Wisc.

space heater 134

Greater productivity during cold weather is made possible for contractors by portable space heaters. This manufacturer's models range in size from 75,000 BTU/Hr. to 450,000 BTU/Hr. Equipped with sturdy handles and well balanced on wheels, these heaters are easily moved about to obtain heat where needed. All models are said to be economical to operate because special built-in atomizing equipment permits the use of low-cost fuel oils. They are clean, safe, ventless and odorless, according to the manufacturer. Kelley Machine Div., Wiesner-Rapp Co., 285 Chicago St., Buffalo, N. Y.

epoxy compounds 135

Folder contains a chart on 6 epoxy compounds for joining, sealing, bonding, patching and resurfacing, where and how to use each, colors available, application methods, curing time, pot life and safety precautions where necessary. Sika Chemical Corp., Passaic, N. J.

portable steel scaffolds 136

A 16-page brochure illustrates the single scaffold unit as well as the numerous set-ups possible with multiple units for work platform areas. Scaffolds are said to assemble easily and quickly to form safe, rigid work platforms adjustable in 3-inch increments from 22 inches to 5 feet 8 inches high. Baker-Roos, Inc., 602 West McCarty St., Indianapolis, Ind.

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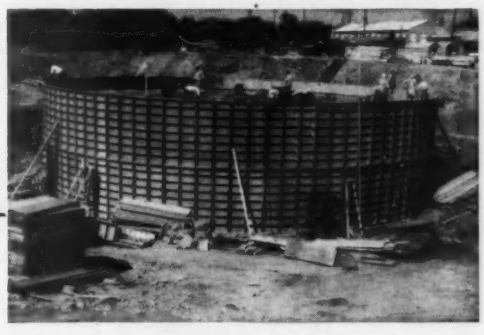
Self-Aligning

HEAVY DUTY CONCRETE FORMS

The name is new because Simplex Forms System, Inc. has purchased the concrete forms division of Waco Manufacturing Co.! And, while the basic Waco forms design is the same, you can count on years of Simplex experience to bring you the finest in quality and workmanship in Simplex-Waco forms.

Ideal for all types of concrete forming, these rugged, flexible forms will now be available on a wider scope through greater distribution.

Whether you buy or rent Simplex-Waco forms, you'll find that their built-in quality, standardized hardware, and proved durability will pay off in smooth, accurate walls job after job. Send for complete details today.



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670 N. Michigan Ave., Chicago 11, Illinois

products

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bonding agent 137

A folder describes a concrete bonding agent for use in new construction to bond delayed topping to base slabs, to bond topping on uneven base slabs and steps, and to bond plaster or stucco to walls and canopy slabs. The material is also recommended for renovation and repair of walls, floors, driveways, sidewalks, and highways. The folder includes photographs of projects where the material has been used. Larsen Products Corp., Bethesda, Md.

rock drilling 138

An 8-page brochure, "Drilling Rock With Coupled Steels," details proper operational and maintenance procedures for coupled rock drill steels and discusses and illustrates correct rotation, drill, and feed control operations, starting a hole, proper feed, drilling, and lubrication practices, adding and removing steels, bit maintenance, and dust control. Thor Power Tool Co., 175 N. State St., Aurora, Ill.

water repellent 139

A brochure describes a transparent silicone water repellent and contains a chart showing results of comparative tests. Photographs give evidence of the water repellent qualities of the product. It is recommended to retard spalling and cracking, prevent interior damage, minimize efflorescence and reduce maintenance costs. Application and suggested coverage for different types of walls are included. Building Products Division, Sonneborn Chemical & Refining Corp., 404 Park Ave., New York 16, N. Y.

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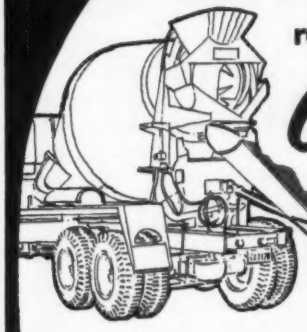

10 DIFFERENT COLORS

- ECONOMICAL—costs very little extra per square foot . . .
- DURABLE—color all-the-way through the concrete . . .
- PERMANENT—to weather and sunlight . . .

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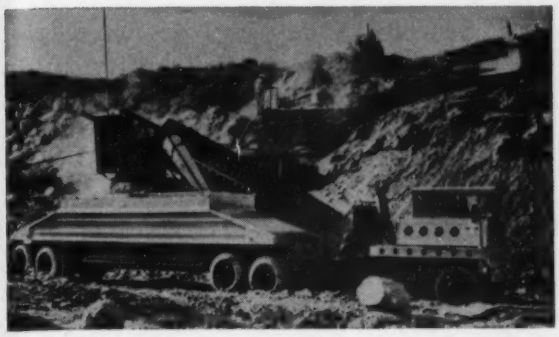
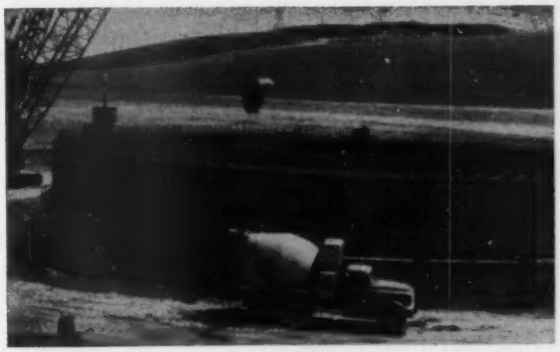


earth moving 140

This machine can be used off highways, hauling up to 45 tons of earth at speeds up to 52 miles an hour, and for full legal payloads on highways. In picture earth is moved to centrally located stationary belt-type loader where 45-ton payload is loaded in less than 30 seconds. On other jobs, unit teams up with a combination moving belt-type blade and loader, both units moving along together. Challenge-Cook Bros., 3334 San Fernando Rd., Los Angeles, Calif.

set retarder 141

By using 3 cranes and limiting the height of the layers to 18 inches, placement of concrete was held to about 3 hours for each pass around 399-foot circumference of this sewage pumping station at Deer Island in Boston Harbor. To make certain no concrete would begin to set, an initial set retarder was used, keeping concrete plastic for at least 4 hours. Each layer was vibrated with the one beneath it, eliminating cold joints and producing concrete of monolithic nature. Dewey and Almy Chemical Div., Cambridge, Mass.



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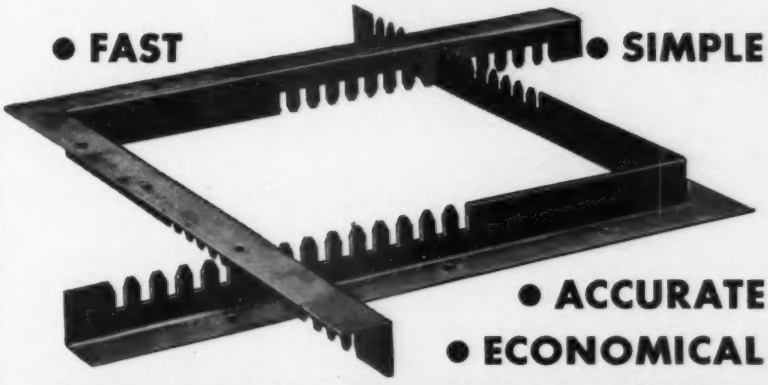

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